An Account of some Experiments, performed with a View to ascertain the most advantageous Method of constructing a Voltaic Apparatus, for the Purposes of Chemical Research. By John George Children, *Esq. F.R.S.* Read November 24, 1808. [*Phil. Trans.* 1809, *p.* 32.]

The object of the author is to determine how the greatest effect may be produced by the voltaic battery, with the least waste of power and expense.

For this purpose he had one battery constructed of twenty pairs of plates of zinc and copper of large dimensions, each plate being four feet long and two feet wide. Each pair was connected together only at the top by a strap of lead, so that both sides of each plate were exposed to the action of the fluid in the trough. The trough was made entirely of wood, with wooden partitions, made water-tight by cement; and this battery when in action was charged with a mixture of three parts nitrous acid, with one of sulphuric diluted with three parts of water.

With this battery,

1. Eighteen inches of platina wire $\frac{1}{30}$ of an inch in diameter were fused in about twenty seconds.
2. Three feet of the same wire became visibly red by strong daylight.
3. Four feet of the same became very hot, but not visibly red.
4. Charcoal burned with intense brilliancy.
5. On iron wire, the effect was remarkably feeble. Not more than ten inches of the finest harpsichord wire could be fused by it.
6. Imperfect conductors were scarcely affected by it. No effect was produced upon barytes mixed with red oxide of mercury and water.
7. A gold-leaf electrometer was not affected by it.
8. The shock from this battery was scarcely perceptible.

The author's second battery consisted of 200 plates, about two inches square, placed in half-pint pots of common Queen's ware.

1. With this battery potash and barytes were readily decomposed.
2. The metallization of ammonia took place with great rapidity.
3. It visibly ignited charcoal.
4. It caused a strong divergence of the gold-leaf electrometer.
5. It gave vivid sparks for upwards of three hours, and was not exhausted till after forty hours.

The results of the foregoing experiments are considered as a confirmation of Mr. Davy's observation, that intensity increases with the *number*, and the *quantity* of electricity with the *extent* of the surface.

The effect of quantity is seen in the first experiment on platina wire. This metal not being oxidated presents no obstacle to the passage of the electricities, which evolve, on their mutual annihilation, heat sufficient to raise the temperature of the platina to the point of fusion.

Nevertheless from want of *intensity*, this quantity could not find a ready passage through the suboxidated iron wire, and could produce no effect upon barytes or other bodies liable to be decomposed by

the greater energy of the small battery. In this the number of plates being tenfold gives tenfold intensity, although the aggregate quantity of surface in the whole battery is not $\frac{1}{30}$th part of the acting surfaces in the large battery.

The advantage of a large quantity of fluid is evinced by the long-continued action of the small battery; and it is also observed that in very numerous combinations, a certain distance between the plates becomes necessary to prevent spontaneous discharges, which the author found to take place in a battery of 1250 plates of four inches square.

With this battery of 1250, excited by a fluid of the same strength as was used in the former experiments, the author ascertained the striking distance through the air to be $\frac{1}{50}$th of an inch, care having been taken to dry the air, through which the discharge took place, before the experiment, as well as to avoid any increase of temperature previous to the discharge.

The electric *light* was also made to pass through a vacuum, and was observed to be the same as from a common electrical machine.

The effect of this great number of plates on imperfect conductors, was of course uncommonly powerful, but yet their *power of fusion* was comparatively weak, as they barely melted half an inch of the same platina wire that had been used in the former experiments; and hence it is evident that the construction must be different according to the purpose for which the battery is designed.

For igniting perfect conductors large plates are necessary, but they need not be numerous; and for overcoming the resistance of imperfect conductors number is requisite, but the size of the plates may be small.

The new method of constructing the trough wholly of wood, with moveable plates joined together only at top, is much preferred to the old construction, as the plates are more easily cleaned or repaired, and as they expose double extent of surface.

The Bakerian *Lecture. An Account of some new analytical Researches on the Nature of certain Bodies, particularly the Alkalies, Phosphorus, Sulphur, Carbonaceous Matter, and the Acids hitherto undecompounded; with some general Observations on Chemical Theory. By* Humphry Davy, *Esq. Sec. R.S. F.R.S. Ed. and M.R.I.A.* Read December 15, 1808. [*Phil. Trans.* 1809, *p.* 39.]

The objects which principally occupied Mr. Davy's attention in the present lecture are, the elements of ammonia; the nature of sulphur; the nature of phosphorus; the states of the carbonaceous principle in plumbago, charcoal, and diamond; the analysis of boracic acid; the analysis of fluoric acid; with a series of numerous experiments on muriatic acid.

With respect to ammonia, he has been induced to reconsider the subject, not from any doubt which he himself entertained of the correctness of his former results, but on account of the opinion still